

# From Crisis to Transition: The State of Russian Science based on Focus Groups with Nuclear Physicists

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# **From Crisis to Transition: The State of Russian Science Based on Focus Groups With Nuclear Physicists**

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*In high-quality scientific work, a lag of five to six years is essentially equivalent to complete death....Russian science is already lagging behind by five years.<sup>2</sup>*

*The common understanding is that science in Russia is now in a state of crisis....it would be more accurate to describe its current condition as comatose.<sup>3</sup>*

The collapse of the Soviet system led to a sharp contraction of state funding for science. Formerly privileged scientists suddenly confronted miserly salaries (often paid late), plummeting social prestige, deteriorating research facilities and equipment, and few prospects for improvement. Many departed the field of science for more lucrative opportunities, both within Russia and abroad. The number of inventions, patent applications, and publications by Russian scientists declined. Reports of desperate nuclear physicists seeking work as tram operators and conducting hunger strikes dramatized the rapid collapse of one of the contemporary world's most successful scientific establishments. Even more alarming was the 1996 suicide of Vladimir Nechai, director of the second largest nuclear research center in Russia (Chelyabinsk-70, now known as Snezhinsk). Nechai, a respected theoretical physicist who spent almost 40 years working on Soviet and Russian nuclear programs, killed himself because he could no longer endure his inability to rectify a situation in which his employees had not been paid for more than 5 months and were "close to starvation."<sup>4</sup>

The travails of Russia's scientists sparked interest in the West primarily because of the security threat posed by their situation. The seemingly relentless crisis in science raised fears that disgruntled scientists might sell their nuclear weapons expertise to countries or

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<sup>2</sup> Nick Holdsworth, "Russians Go On Hunger Strike Over Science Policy," *Times Higher Education Supplement*, 18 October 1996.

<sup>3</sup> Vladimir Zakharov and Vladimir Fortov, "Science in Russia Is Already in a Coma," *Science*, 5 May 1995.

<sup>4</sup> Svetlana Kovaleva, "Desperate Russian Nuclear Scientist Commits Suicide," *Reuters*, 31 October 1996.

organizations that harbor hostile intentions toward the United States. Such concerns are particularly pressing in the wake of the September 2001 terrorist attacks in the US.

At the same time, we should not overlook other critical implications that the state of Russian science has for Russia's long-term economic and political development. It is in the West's interest to see Russia develop a thriving market economy and stable democracy. A successful scientific community can help on both counts. Science and technology can attract foreign investment and fuel renewed economic progress in Russia. Russian scientists could also be an important source of support for democratic norms: sociologists of science have long argued that scientists tend to support democracy because it provides them with the freedom in which their research can flourish.<sup>5</sup> At the same time, a more recent study suggests that funding shortages may override the researcher's need for freedom and drive scientists to align themselves with the economic policies espoused by Nationalists and Communists in order to survive.<sup>6</sup> Therefore, much turns on the question: "What is the state of science in Russia today?"

The good news is that focus group interviews with Russian nuclear physicists conducted in October 2001 suggest that the "science in crisis" image is one-sided and misleading. Though scientists still complained about low salaries, lack of respect in society, and other similar issues, the participants in the focus groups also expressed positive sentiments about recent changes in the field of science. To be sure, the financing of science remains at a considerably lower level than during the heyday of Soviet times. Yet, it is now possible to earn a decent living as a scientist because of the greater availability of foreign and domestic grants and contracts. In addition, state funding has stabilized over the past few years. Thus, it is more accurate to say that Russian science is in a state of transition rather than in a state of crisis.

### **Facilitating the Shift From a Command Economy to the Marketplace**

In order for science to flourish in Russia, it is critical that researchers be fully integrated into the global scientific community. Soviet-era scientific institutions must be reformed so that Russian scientists can reorient themselves toward commercially advantageous research. Otherwise expenditures on science will remain economically inefficient and unproductive. If Russian science is to be revived in such a way that benefits the economy, democracy, and international security, scientists must understand and accept heretofore unfamiliar international practices, norms, and rewards associated with scientific research.

Toward this end, the US government has created a number of programs to assist Russian scientists, such as the State Department's International Science and Technology Center (ISTC), the Department of Energy's Initiatives for Proliferation Prevention (IPP) and its Nuclear Cities Initiative (NCI). These programs are aimed at former weapons scientists, who are encouraged to redirect their research efforts to commercially viable civilian applications. Through participation in these programs, scientists learn how to write

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<sup>5</sup> Don K. Price. *The Scientific Estate*. Cambridge: Harvard University Press. 1965, p. 270.

<sup>6</sup> Loren R. Graham, *What Have We Learned About Science and Technology From the Russian Experience?* Stanford, CA: Stanford University Press, 1998, pp. 50-51.

grants, interact with colleagues in other countries, gain information on the state of their field, discover where they can contribute, and develop an appreciation for international laws and norms regarding scientific research. Under an existing 10-year Umbrella Agreement on S&T cooperation between Russia and the US signed in 1993, more than 15 US agencies have been engaged in projects with Russian scientists that range from public health and medicine to agriculture, the environment, space, energy, information technology, and a wide range of basic science disciplines.<sup>7</sup>

This strategy may be bearing fruit. Many new ventures on the part of Russian scientists have succeeded – often with seed money from Western assistance programs. A recent survey indicates that the desire to emigrate is now considerably lower among scientists in closed cities than it was in 1992.<sup>8</sup> The latest official statistics show an upswing in several indicators of scientific performance in Russia, such as patent applications, and in public opinion regarding the benefits of science and technology.<sup>9</sup> And, information from focus group interviews also suggest that Russian science may be better off than it was in the first half of the 1990s.

### **Focus Group Sample**

In October 2001 we conducted four focus groups involving 19 nuclear physicists from three formerly closed institutes: 1) The Institute of Physics and Power Engineering in Obninsk; 2) The Joint Institute of Nuclear Research in Dubna; 3) The Moscow Engineering Physics Institute. These groups are the first part of an effort to illuminate how Russian scientists perceive recent changes in their professional lives, their current situation, and the role of Western programs and grants.

Nuclear scientists are not representative of Russian scientists in general, nor are the participants in our groups necessarily representative of nuclear scientists. But the focus group approach offers a more systematic, detailed, and objective look at the perceptions of a concrete group of Russian scientists than can be gleaned from anecdotal reports. The next phase of our study will involve a survey of 1,200 Russian scientists to test the generalizability of the focus group results. Here we summarize the main findings from the groups regarding scientists' views on the current state of Russian science. We emphasize views that were expressed in multiple groups.

### **Russian Scientists on the State of Russian Science**

#### **Positive Sentiments**

Belying the one-sided image of “science in crisis” often promoted in the media, interviews with Russian scientists revealed many positive developments, including: a) an

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<sup>7</sup> Congressman Curt Weldon has proposed additional areas and topics on which US and Russian scientists can cooperate. See, his *U.S.-Russia Partnership: A New Time, A New Beginning*, November 2001.

<sup>8</sup> Valentin Tikhonov, *Russia's Nuclear and Missile Complex: The Human Factor in Proliferation*, Carnegie Endowment for International Peace, 2001.

<sup>9</sup> *Russian Science and Technology at a Glance: 2000*. Center for Science Research and Statistics, Moscow, 2001.

increase in federal funding and the elimination of wage arrears; b) an increase in state orders; c) greater availability of grants and contracts that not only provide funding, but enable Russian scientists to interact with the international scientific community.

All the groups indicated that the financial situation at their institutes had stabilized or even improved during the last few years: “[I]f we are talking about the last 2-3 years, there has been a certain tendency toward stabilization. Before they didn’t pay us our pay and we had the impression that everything was collapsing. Now somehow things have generally become more stable – not everything – but there is a tendency toward stabilization....A certain confidence has appeared.” Apart from the widely noted cessation of wage arrears, many participants alluded to recent increases in state orders and contracts. Of particular interest, one participant claimed that a state contract won through a competitive bidding process currently provides 50% of his laboratory’s financing. Another said that state funding for defense-related projects had recently increased, and that this significantly improved the general sense of stability: “In the last 2-3 years it seems like the volume of financing connected with military research has increased....In the preceding years our defense orders were 0%, but now we are starting to get them....And this is positive because as a rule, defense orders are not just for one year; they are for a longer period, and thus give a greater sense of stability.”

Surely the perceived stabilization is in large part due to the improvement in the Russian economy during the last three years. Economic growth and an improved taxation system has increased the federal budget, making more money available for science and increasing the demand of Russian firms for technological innovations: “In the last 2-3 years our industry has started to grow. And therefore we have started to see opportunities to make agreements [with firms].” Three of the four groups also noted recent improvements in the availability of computers and internet access.

When asked whether their own labs were among the successful ones, almost without exception they replied affirmatively. Several added “otherwise, I would not be sitting here with you now,” raising the possibility that less successful scientists are under-represented in our groups.

All groups acknowledged the important financial contributions made by grants from funds such as the ISTC, NATO, INTAS, and other contracts with foreign firms and partners. Some view the awarding of grants as more meritocratic than the old Soviet system of handing out block funding to each institute. They believe that grants reward the most capable and energetic scientists, and weed out those less capable. Grants also give scientists a means of working independently of the institute administration. They encourage the formation of capable, effective research groups, and, at least in some cases, they lead to direct contracts with foreign firms. Group participants noted a number of concrete instances where funding from international grants led to longer-term collaborations with foreign partners and firms. One physicist described at length a joint Russian-Japanese project involving the utilization of plutonium, adding that, “if we hadn’t receive support from the ISTC, this project never would have happened.” Another participant expressed frustration that his proposal was not accepted by ISTC even after

ISTC had provided seed money for its development. Yet, he went on to describe the importance of the seed grant for his later success: “Working within the framework of ISTC gave me enormous experience and understanding about what our foreign colleagues need from us and how to receive their financial support. That first grant opened the path to all the other grants I since received. It became clear what to do and how to do it. Naturally, the other grants compensated for the fact that the ISTC proposal was not funded.”

Group participants overwhelmingly expressed deep appreciation for the newfound opportunities provided by grants to travel abroad and make contacts with foreign colleagues. Such contacts permit them to determine their true standing in the international scientific community, learn what kind of work interests foreign entities, and establish collaborative relationships that can and often do lead to additional funding. Thus, the availability of grants reinforces the benefits of foreign travel and exchanges.

### **Negative Assessments: Financing, Recruitment, Bureaucracy**

While participants acknowledged recent improvements in the availability of funds, they nonetheless lament the meager level of state financing as compared to the Soviet era. They viewed the drop in state financing as responsible for low salaries and low prestige of scientists, obsolescence of facilities and equipment, and the departure of colleagues from the field of science.

Participants expressed grave concern about “the aging of their institutes.” They perceive the sparse salaries and low prestige as adversely affecting their ability to attract the best and the brightest to the field of science. “People are proud to call themselves ‘businessman’ even it means they sell eggs at the market, but the title ‘scientist’ is laughable; it’s a synonym for a starving person.” They also cited the more materialistic orientation of young Russians as well as broader failures of the Russian education system: “As a member of our admissions committee, I can say that most of those who come to work as graduate researchers are C-students (*troechniki*).” In addition, “the young scientists we get are, excuse me for saying so, unformed material, who either want to get out of the army (because our staff and graduate students are exempt from the army) or have some other motivation, or just have nowhere else to go. Or they cannot do anything else except enter our institute – no firm will hire them because they are dawdlers....You see, we get the leftovers.”

The groups also complained about bureaucratic obstacles to their work. These come in various guises. One group emphasized the Russian government’s new export control policies, which some participants find excessive and burdensome to comply with. Another cited a growth of bureaucracy within their institute, which they attributed to the increasing complexity and indeterminacy of the system for financing science. In the past, the State gave the institute a certain sum of money, which the institute director then handed out according to his criteria. Today, new regulations require scientists to write reports justifying how the money will be spent prior to receiving funding. Moreover, Russian scientists for the first time are experiencing the complexity of budgets; they are

having difficulty understanding why a leaky roof cannot be repaired if there is no money allocated in the budget for capital repairs. “Now there are dozens of budget lines, all of which have to be stipulated in advance. But, we do not know in advance what we will need....The system of expenditure should be more flexible.”

Finally, some viewed the pursuit of grants, and the associated reporting and accounting requirements as inimical to science. Such tasks distract from scientific work, lead to the subordination of science to commercial and bookkeeping skills, and to the abandonment of fundamental science in favor of applied research. The problem stems from the institute’s lack of resources to hire staff who specialize in grant administration. Moreover, scientists are no longer free to work on what interests them, rather they are compelled to engage in work that attracts grants. And, the need to attract multiple grants to economically support a laboratory leads to a proliferation of research topics in a given lab, whereby the overall quality of work suffers.

Many wished that the Russian government provided all the funds necessary for scientific research. If the state raised the level of science financing, then all the key problems – low prestige, recruitment issues, equipment – would be solved. But no participants held out much hope that a resurgence of state financing to Soviet-era levels is in the cards. Like it or not, they appear to accept that financing based on grants and contracts will remain an essential source of funding for research.

### **Conclusion: Addressing the Challenges Facing Science in Transition**

The picture emerging from the focus groups is more complex than alarmist accounts of “Russian science in crisis” suggest. Participants did report continuing frustration at the loss of state financing, the difficulties of attracting quality new recruits to science, and the growth of bureaucracy. But they also pointed to positive changes in Russian science in recent years, tied mainly to the availability of Western grants and contracts, greatly improved exchanges with the international scientific community, and a newfound stability in their institutes’ financial situation.

The focus groups do not give a sense of how widespread the positive and negative indicators are in the larger scientific community – that will be the task of our larger survey. However, the persistence of certain “old” norms among some Russian scientists testifies not to the absence of a transition in science, but to its inevitably drawn-out and uneven nature. We can hardly expect a normative re-orientation to take place rapidly, especially when institutional change in Russian science has been slow, apart from the advent of grant-based financing and open international travel. Inevitably, the fortunes of individual scientists will continue to diverge radically, as some are better positioned than others – due to ability, luck, or a combination of both – to take advantage of the new emphasis on work with practical, profitable applications. Many scientists who lose out in the process will be discouraged and blame the reforms. But the key to the positive development of Russian science is not to make all scientists happy – which is neither possible, given limited resources, nor even desirable – but to provide a structure of incentives that offers hope to those most energetic and capable.



If Russian science has survived its most severe crisis and is now on a path of transition to a different, perhaps “leaner and meaner” footing, it is at least in some measure due to Western grants and contracts and access to Western colleagues. Now is certainly not the time to diminish efforts to shift Russian science to a market-based, civilian-oriented, internationally integrated footing. The US should continue to provide selective financial support for Russian scientists on a competitive basis, emphasizing those proposals that potentially have eventual commercial applications. For its part, the Russian government would help matters by refraining from policies that seek to isolate Russian scientist from foreigners, such as the Academy of Science regulation issued in June 2001 that scientists had to report all contacts with foreigners.<sup>10</sup> It should also demonstrate to scientists that it values their work by honoring its public commitment to finance science at the level of 4% of the annual budget, especially now that the economy is growing. But the lion’s share of this financing should not be handed out in the form of block grants to institutes or via the Academy of Sciences. Instead, the majority of state funding should be distributed on competitive principles. A share should also be devoted to promoting the research capabilities of university departments, in order to improve prospects for recruiting a new generation of quality specialists. Instituting special grants for young specialists might also contribute to this end.

We do not wish to create an overly optimistic impression. Russian science has suffered severe blows since the collapse of the Soviet Union. Many serious obstacles remain to its successful resurgence. As long as its difficulties continue, so will the threat to international security. No amount of scholarly research can precisely assess the magnitude of this threat. But as more research on the actual orientations of Russian scientists becomes available, we believe that the “science in crisis” perspective should and will give way to a more complex but more accurate picture of the transition underway in Russian science – and a better sense of how to facilitate it.

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<sup>10</sup> Andrei Vaganov, Will Russian Science Survive Without State Funding or Western Grants? *Kompaniya*, No. 22, 11 June 2001.